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A NEW SPECIES OF THE GENUS *PEDETONTINUS* (MICROCORYPHIA, MACHILIDAE) FROM CHINA

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Abstract *Pedetontinus laoshanensis* sp. nov. is described from Jiangsu Province, China. It is characterized by the parameres of 1 + 6 divisions and the ratio of length to basal width of urosternite V about 2/3. It is closely related to *P. tianmuensis*, *P. taishanensis* and *P. wudangensis*, but differs in the ratio of length to width of compound eye, the number of division of gonapophysis, the extending position of penis and parameres, and the ratio of basal part to terminal part of penis. The updated key to the species of *Pedetontinus* in the world is provided. We also examined the inter-species relationships of Chinese *Pedetontinus* based on partial sequences of mitochondrial cytochrome c oxidase subunit I (CO I). CO I gene sequences using Kimura's two parameter model showed intraspecies genetic divergence (< 1.3 %) and interspecies divergence ranged from 9.6 % to 15.4 %. The molecular study further supported the species status of *P. laoshanensis* sp. nov.

Key words Archaeognatha, Microcoryphia, *Pedetontinus*, new species, China, CO I.

1 Introduction

The genus *Pedetontinus* Silvestri, 1943 can be easily recognized by the absence of scales on antennal flagellum, 1 + 1 eversible vesicles present on abdominal segments I - VII, paired ocelli shoe-shaped. 17 species of the genus *Pedetontinus* Silvestri have been recorded from China, Japan and Korea (Silvestri, 1943; Mendes, 1990a, b; Xue and Yin, 1991; Choe and Lee, 2001a, b; Zhang *et al.*, 2005; Zhang and Li, 2009; Cheng *et al.*, 2011; Zhang and Zhou, 2011). Those species can be divided into three group, viz: "wide-eyed group" (*P. aureus* Choe and Lee, 2001; *P. lineatus* Choe and Lee, 2001; *P. luanchuanensis* Cheng *et al.*, 2011; *P. rhombeus* Choe and Lee, 2001; *P. songi* Zhang and Li, 2009; *P. tianmuensis* Xue and Yin, 1991; *P. yinae* Zhang *et al.*, 2005; *P. jiuzhaiensis* Zhang and Zhou, 2011; *P. maijiensis* Zhang and Zhou, 2011; *P. wudangensis* Zhang and Zhou, 2011), "long-eyed group" (*P. szeptyckii* Mendes, 1992) and "long-equal-wide-eyed group" (*P. ishii* Silvestri, 1943; *P. dicrocerus* Silvestri, 1943; *P. kuwanae* Silvestri, 1943; *P. esakii* Silvestri, 1943; *P. yosii* Silvestri, 1943; *P. taishanensis* Zhang and Zhou, 2011). To date, there are about 29 species of Archaeognatha found in China (Silvestri, 1943; Xue and Yin, 1991; Sturm and Machida, 2001; Huang *et al.*, 2006; Yu *et al.*, 2010; Deng *et al.*, 2011; Song *et al.*, 2011; Zhang and Zhou, 2011).

During the study of the bristletail specimens collected from Nanjing City, Jiangsu Province, China, one species of genus *Pedetontinus* was identified as new to science and described in present paper. The updated key to the genus *Pedetontinus* in the world is also provided. We also examined the inter-species relationships of Chinese *Pedetontinus* based on partial sequences of mitochondrial cytochrome (CO I).

2 Materials and Methods

2.1 Morphology

All specimens were preserved in 95 % alcohol to prevent DNA degradation. Taxonomically important parts of species were dissected and mounted on slides in Tendeiro liquid. All materials were examined under a Nikon SMZ 1500 stereomicroscope or an Olympus BH2 compound microscope. The remaining samples were put in 1.5 ml plastic tubes with 100 % alcohol and stored at -20 ℃ for DNA extraction.

The specimens are deposited in the College of Chemistry and Life Science, Zhejiang Normal University, China. The morphological terminology follows that of Mendes (1990b). The measurements in the paper are in millimeters (mm).

2.2 DNA extraction, amplification and sequencing

DNA was extracted from the specimens using the DNeasy Blood and Tissue Kit (Qiagen, Hilden Germany). Purified DNA was amplified for CO I mitochondrial sequences via polymerase chain reaction (PCR) using primers CO I-F (5′-ACA AAT CAT AAG GAT ATT GG-3′) and C1-N-2329 (5′-ACT GTA AAT ATA TGA TGT GCT CA-3′) (Simon *et al.*, 1994; Zhang and Zhou, 2011). In the PCR 50-μl reaction volumes were used according to instruction.

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Initial denaturation (4 min at 94 ℃) was followed by 35 cycles of 50 s at 94 ℃, 50 s at 48 ℃, 60 s at 72 ℃, and a final extension at 72 ℃ for 10 min, using a MJ Mini thermal cycler (BioRad, USA). The PCR clean-up of PCR products was performed using an Axygen PCR clean-up kit (Axygen, Hangzhou, China); in cases where gel purification was necessary, the Axygen agarose-out kit (Axygen) was used. The purified DNA was sequenced in forward and reverse directions by ABI PRISM 377 or 3730.

2.3 Analysis of DNA sequences

The nucleotide data (744 bp) were aligned using CLUSTAL W in MEGA 5.0 (Tamura *et al.*, 2011). Neighbour joining analysis (NJ) and Maximum parsimony analysis (MP) was performed with PAUP* 4.0b10 (Swofford, 2002) using one thousand bootstrap replicates. Bayesian inference analysis (BI) was performed with MRBAYES 3.0B4 (Huelsenbeck and Ronquist, 2001), using the GTR + I + G model. Eight chains ran in parallel for 1 000 000 generations, sampling trees every 1 000 generations. Bayesian analyses were repeated twice, always retrieving the same topology. According to the likelihood plots, -lnL values stabilized with 20 000 generations, so the first 20 000 generations were discarded as burn-in, while Bayesian posterior probabilities were calculated according to the remaining set of trees. Model selection for the nucleotides alignment dataset was performed with Modeltest version 3.7 (Posada and Crandall, 1998). The model of GTR + I + G was chosen for Bayesian analyses. The CO I gene information of *P. laoshanensis* has been assigned GenBank accession No. EU699175 - EU699177.

3 Results and Discussion

3.1 Molecular analysis

The total alignment of the sequenced portions of Chinese *Pedetontinus* mitochondrial CO I gene consist of 744 bp. There are 218 variable sites in the 744 bp character matrix (29.3 %). In most cases, the CO I gene sequences using MEGA 5.0 with Kimura's two parameter model (K2p) showed intraspecies genetic divergence (< 1.3 %) and interspecies genetic divergence ranged between 9.6 % (*P. wudangensis* versus *P. laoshanensis* sp. nov.) and 15.4 % (*P. wudangensis* versus *P. taishanensis*) (Table 1). The average interspecies divergence of *Pedetontinus* is 12.7 % and the average intraspecies genetic divergence of *Pedetontinus* is from 0 to 1.3 %.

Both the phylogenetic position of *P. laoshanensis* in the trees (BI, MP, and NJ) (Fig. 1) and the genetic distances between interspecies of *Pedetontinus* (Table 1) supported that *P. laoshanensis* is a new species. Considering both the morphological and molecular evidence, the new species, *P. laoshanensis* sp. nov., is new to science herein.

Table 1. Genetic diversities among interspecies of *Pedetontinus* based on CO I sequences using Kimura 2-parameter model.

	Species of *Pedetontinus*	1	2	3	4	5	6	7	8	9
1	*P. luanchuanensis*									
2	*P. songi*	0.133								
3	*P. tianmuensis*	0.141	0.119							
4	*P. wudangensis*	0.127	0.129	0.093						
5	*P. maijiensis*	0.116	0.131	0.125	0.111					
6	*P. taishanensis*	0.140	0.138	0.137	0.154	0.147				
7	*P. jiuzhaiensis*	0.121	0.142	0.132	0.119	0.118	0.131			
8	*P. yinae*	0.136	0.134	0.110	0.106	0.128	0.136	0.109		
9	*P. laoshanensis* sp. nov	0.121	0.129	0.097	0.096	0.119	0.140	0.104	0.109	

3.2 Taxonomy

Machilidae Grassi, 1888

Petrobiinae Pacl t, 1970

***Pedetontinus laoshanensis* sp. nov.** (Figs 2 - 17)

Holotype ♂ (No. ZJNUSB050), under basalt rock covered with lichen or pine needle of Mt. Lao (32°07′N, 118°36′E; alt. 145 m), Nanjing City, Jiangsu Province, China, 1 Aug. 2004, collected by LI Peng and ZHANG Jia-Yong. Paratypes: 7 ♂♂ (No. ZJNUSB051 - 057), 8 ♀♀ (No. ZJNUSB058 - 065), same data as holotype; 5 ♂♂ (No. ZJNUSB066 - 070), 6 ♀♀ (No. ZJNUSB071 - 076), under rock with deadwood and defoliation of Mt. Qixia (32° 09′ N, 118° 57′ E; alt. 121 m), Nanjing City, Jiangsu Province, China, 15 May 2011, collected by LI Peng, YU Dan-Na and ZHANG Jia-Yong.

Males. Body length 7.0 - 8.0 mm (n = 13); antennae 5.8 - 6.0 mm; terminal filament 7.5 - 8.0 mm; cerci 2.9 - 3.3 mm. Body reddish brown brownish grey, covered densely with scales and with pigments. Terga mostly covered with brown scales. No black spots present on body side of terga Ⅶ. Epidermic pigment on head capsule, labium, labial

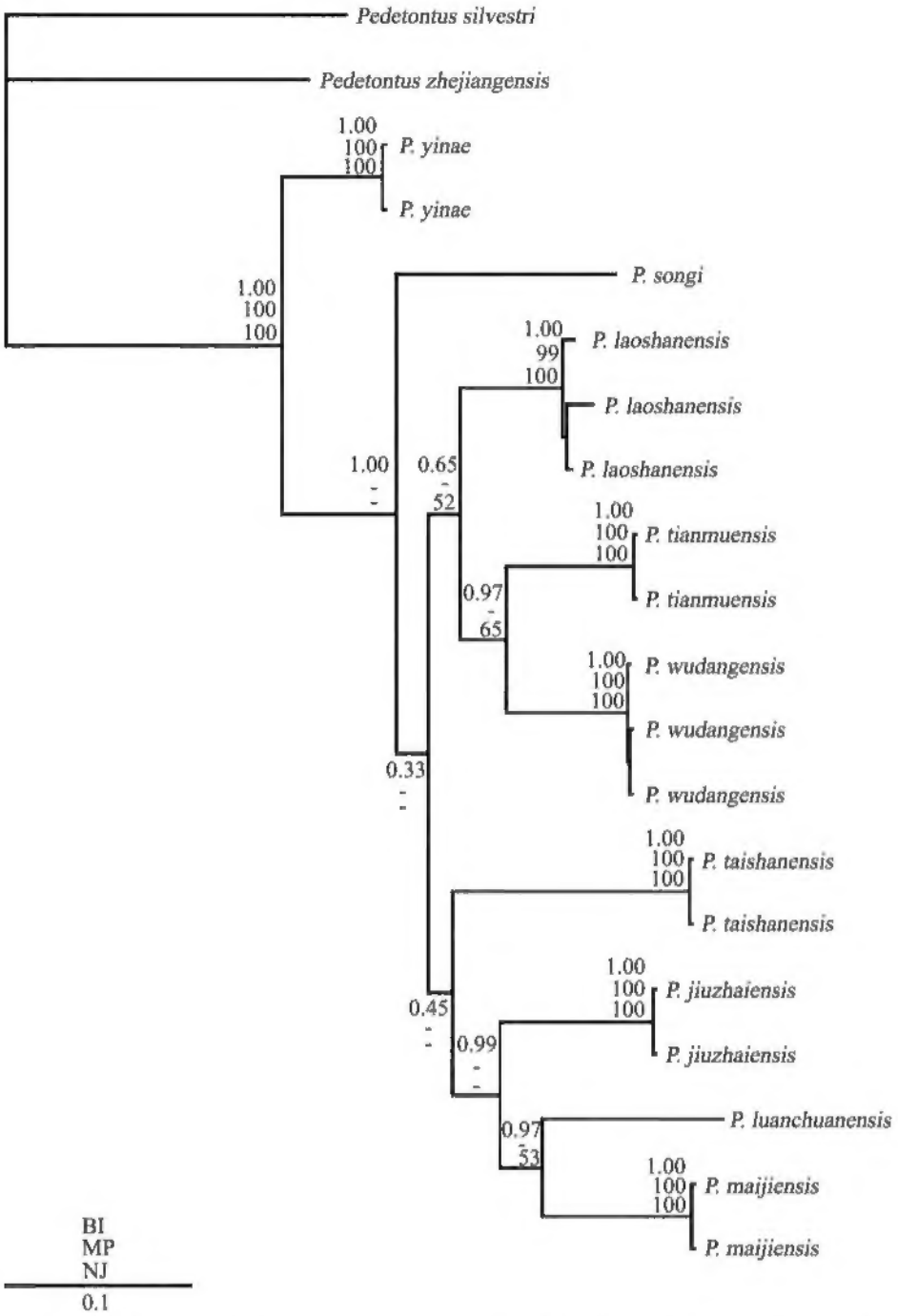


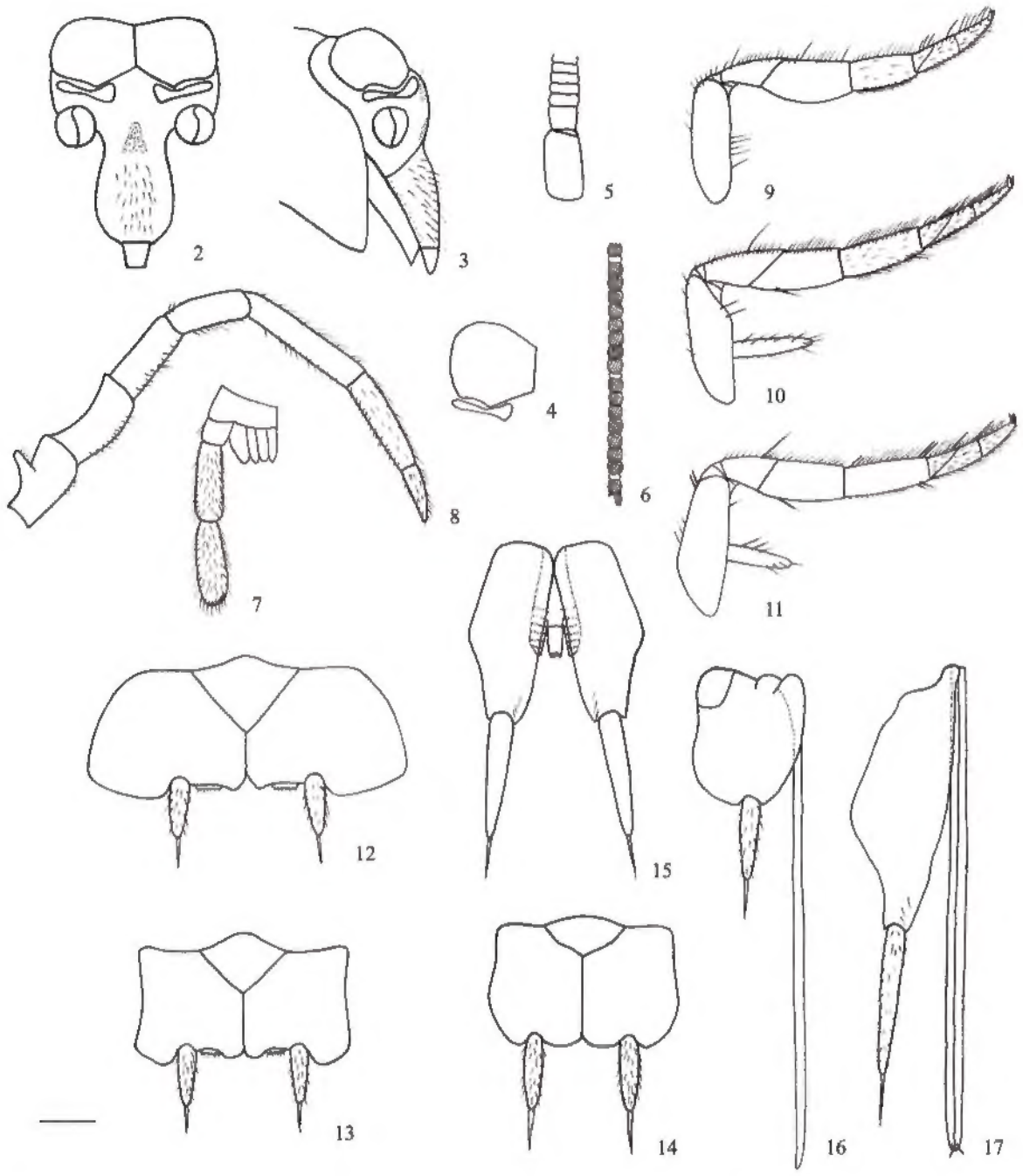
Fig. 1. Phylogenetic tree of the relationships among 11 bristletail species based on cytochrome oxidase subunit I (CO I) gene sequences. Branch lengths and topology are from the Bayesian analysis. Numbers above branches specify posterior probabilities from Bayesian inference (BI), maximum parsimony (MP, 1 000 replicates) and neighbour joining (NJ, 1 000 replicates) analyses, respectively.

palp, mandibles, maxillae, maxillary palp.

Head brown between antennae, clypeus and labrum (Figs 2 - 3). Clypeus and labrum covered with numerous short, thin setae. Frons convex moderately, with two long setae.

Compound eyes round, large and black-brownish, with a small yellowish patch on inner corner (Fig. 2), ratio of contact line to length (cl/l) as 0.50 -0.55; ratio of length to width (l/w) as 0.99 - 1.00. Paired ocelli shoe-shaped, enlarged in submedian area, reddish brown (in alcohol) (Fig. 4).

Antennae (Figs 5 - 6) shorter than body, ratio of antennae length to body length about 0.8 - 0.9. Scapus and pedicellus of antennae densely scaled, flagellum not scaled. Scapus rather long (ratio of length to width about 1.5); pedicellus length equal to width. Flagellum uniformly brownish, junctions



Figs 2 – 17. *Pedetontinus laoshanensis* sp. nov. 2 – 15. Male. 16 – 17. Female. 2. Head, frontal view, 3. Head, lateral view, 4. Oculus and ocellus. 5. Part of antenna with distal chain. 6. Part of antenna with scapus. 7. Labial palp. 8. Maxillary palp. 9. Fore leg. 10. Mid leg. 11. Hind leg. 12. Urosternite Ⅴ. 13. Urosternite Ⅶ. 14. Coxite of the Ⅷ abdominal segment. 15. Coxite of the Ⅸ abdominal segment with genital appendages. 16. Coxite of the Ⅷ abdominal segment with anterior gonapophyses. 17. Coxite of the Ⅸ abdominal segment with posterior gonapophyses. Scale bar = 0.25 mm.

between segments light-grey. Maximum divisions of flagellum maximum observed as 22 – 23, proximal 9 divisions not annulated, divisions 10 – 14 annulated into 2 – 5 annuli, divisions 15 – 17 with 6 – 8 annuli, 18 – 23 with 9 annuli. The distal chains with 9 – 10 annuli, each one about as long as wide.

Labial palp as show in Fig. 7, article Ⅰ withou scaled and articles Ⅱ – Ⅲ sparsely scaled and with dense setae; article Ⅲ almost club like, with sensorial cones on ventral apical part.

Mandibles quite robust, with four typical apical teeth. Article Ⅰ – Ⅶ of maxillary palp (Fig. 8) with setae on ventral surface. Setae in articles Ⅵ – Ⅶ denser than those in articles Ⅰ – Ⅴ. Article Ⅱ – Ⅵ scaled densely, and article Ⅶ scaled sparsely. External apophysis of article Ⅰ cone-shaped and slightly curved

backwards with setae sparsely on ventral surface. Article Ⅱ with dense short setae on ventral surface, not extending beyond article Ⅲ. Article Ⅲ with dense short setae on ventral surface except center area without setae and two setae on internal distal end on dorsal surface. Article Ⅳ with dense short or long setae on ventral surface, one long setae on center ventral surface, and one long setae on internal distal end. Article Ⅴ with dense setae on ventral surface and sparse setae on dorsal surface. Article Ⅵ – Ⅷ with dense setae, article Ⅷ cone-shaped. Dorsal surface of the articles Ⅴ – Ⅷ with hyaline spines Ⅴ as 2 – 4, Ⅵ as 12 – 14, Ⅶ as 10 – 14. Length ratio of article Ⅶ/Ⅵ as 0. 60 – 0. 63, Ⅳ/Ⅴ as 0. 68 – 0. 72.

Legs and coxal stylets scaled (Figs 9 – 11). Mid and hind legs with coxal stylets (about 1/2 coxal length). Femur of fore leg not swollen, ratio of length to width as 2. 0. One strong black spines present on femur, light-colored. Length of tibia Ⅰ as 0. 36 – 0. 40 mm, tibia Ⅱ as 0. 40 mm, tibia Ⅲ as 0. 50 mm. Fore legs stronger than others, tibia of hind legs elongated.

Urosternites not pigmented. Abdominal stylets not especially elongated except segment Ⅸ. Abdominal segments Ⅰ – Ⅶ with a pair of eversible vesicles. Sternum Ⅴ with nearly right posterior angle (87° – 90°); ratio of length to basal width of sternum Ⅴ as 0. 70 (Fig. 12). Urosternite Ⅶ without swollen on its inner posterior part (Fig. 13). Urosternite Ⅷ without eversible vesicles and parameres (Fig. 14).

Penis and parameres with 1 + 6 divisions (or 7 divisions) extending backward to 1/2 of length of the urosternite Ⅸ (Fig. 15). Penis as long as paramere, ratio of basal part to terminal part as 3. 2, opening of penis small and apical. Male genitalia completely covered by urosternite Ⅸ. Apical spine of abdominal stylets strong, medium-sized. Coxite Ⅸ with 3 – 4 spines near apex. Length ratios of stylet (excluding apical spine) to coxite Ⅴ as 0. 45 – 0. 50, Ⅷ as 0. 54 – 0. 64, Ⅸ as 0. 67 – 0. 70. Length ratios of apical spine to stylet Ⅴ as 0. 50, Ⅷ as 0. 44 – 0. 50, Ⅸ as 0. 33 – 0. 37.

Terminal filament and cerci with numerous scales and setae, but without piliform scales.

Females. Body length 8. 1 – 9. 0 mm (n = 14), antennae 5. 8 – 6. 8 mm, terminal filament 7. 6 – 8. 1 mm, cerci 3. 1 – 4. 0 mm. Scale pattern and epidermic pigment as in male.

Head as in male, with more setae present in the labrum and the clypeus than in male.

Compound eyes as in male, ratio of contact line to length (cl/l) as 0. 50 – 0. 55, ratio of length to width (l/w) as 0. 99 – 1. 00.

Antennae as in male. Length ratio of antennae length to body as 0. 75 – 0. 80. Scapus rather long (ratio of length to width about 1. 5). Maximum divisions of flagellum maximum observed as 23. The distal chains with 9 annuli, each one about 1. 5 times long as wide.

Maxillary palp as in male. Articles Ⅱ – Ⅵ densely scaled. Article Ⅰ only scaled on ventral surface, Ⅵ – Ⅶ with dense setae and Ⅶ cone-shaped. Dorsal surface of articles Ⅴ – Ⅶ with hyaline spines Ⅴ as 1 – 3, Ⅵ as 14, Ⅶ as 11 – 12. Length ratio of article Ⅶ Ⅴ as 0. 6, Ⅳ/Ⅴ as 0. 65 – 0. 68.

Labial palp as in male.

Legs as in male. Femur of fore leg not swollen, ratio of length to width as 1. 70. Spines present on femur, light-colored. Length of tibia Ⅰ as 0. 40 mm, tibia Ⅱ 0. 40 mm, tibia Ⅲ 0. 55 mm. Fore leg stronger than others, tibia of hind leg obviously elongated.

Abdominal segments as in male. Sternum Ⅴ with nearly right posterior angle (87° – 90°); ratio of length to basal width of sternum Ⅴ as 0. 70. Medial part of urosternite Ⅶ projected and swollen, exceeding posterior margin.

Ovipositor robust, with tertiary type and slightly exceeding beyond the stylet of urosternite Ⅸ. Gonapophysis Ⅷ with 40 – 43 divisions, sensilla present except 3 – 4 basal divisions (Fig. 16). Gonapophysis Ⅸ with 38 – 42 divisions, the basal 20 – 24 divisions with some short setae (Fig. 17). Coxite Ⅸ with 3 spines near apex. Length ratios of stylet (excluding apical spine) to coxite Ⅴ as 0. 50, Ⅷ as 0. 68, Ⅸ as 0. 65. Length ratios of apical spine to stylet Ⅴ as 0. 50 – 0. 60, Ⅷ as 0. 47 – 0. 50, Ⅸ as 0. 28 – 0. 35.

Terminal filaments and cerci similar to those of male.

Diagnosis. *P. laoshanensis* sp. nov. belongs to "long-equal-wide-eyed group", with parameres of 1 + 6 divisions, penis and paramere extending backward to 1/2 length of coxite Ⅸ, ratio of basal part to terminal part of penis 2. 4, contact line between oculi slightly shorter than 2/3 length of ocular. *P. laoshanensis* sp. nov. is most closely related to *P. taishanensis*, *P. tianmuensis* and *P. wudangensis*, but differs in the ratio of length to width of compound eye, the number of division of gonapophysis, the extending position of penis and parameres, and the ratio of basal part to terminal part of penis. The new species is easily distinguished from other known *Pedetontinus* species in China and its vicinities as following: the pigmentation of whole body, color pattern, ratio of length to width of eyes, the number of setae of maxillary palp.

Etymology. The specific name refers to the type locality Mt. Lao.

Distribution. China (Jiangsu Province).

The updated key to species of *Pedetontinus* in the world.

1. Compound eye normal, length as long as width, or length longer than width ····· 2
   Compound eye width longer than length ····· 9
2. Compound eye length longer than width, legs with hyaline spines, transparent spiniform seta in legs, penis shorter than paramere ··· ····· ***P. szeptyckii***
   Compound eye length as long as width ····· 3
3. Boundary line between oculi as long as, or longer than 2/3 length of ocular ····· 4
   Boundary line between oculi shorter than 2/3 length of ocular ··· 7
4. Ratio of length to basal width of urosternite V greater than 2/3, a pair of paramere with 1 + 7 articles ····· ***P. ishii***
   Ratio of length to basal width of urosternite V as long as, or less than 2/3 ····· 5
5. Ratio of length to basal width of urosternite V as long as 2/3, a pair of paramere with 1 + 6 articles ····· ***P. taishanensis***
   Ratio of length to basal width of urosternite V less than 2/3 ····· 6
6. Ratio of length to basal width of urosternite V about 3/8, the terminal segments of flagellum with 6 or 7 annuli ··· ***P. dicrocerus***
   Ratio of length to basal width of urosternite V about 1/4, the terminal segments of flagellum with 7 or 8 annuli in female, 9 annuli in male ····· ***P. kuwanae***
7. Ratio of length to basal width of urosternite V less than 1/2 ····· 8
   Ratio of length to basal width of urosternite V about 1/2, a pair of paramere with 1 + 6 articles ····· ***P. laoshanensis* sp. nov.**
8. Ratio of length to basal width of urosternite V about 1/3, the terminal segments of flagellum with 6 or 7 annuli in female, 9 or 10 annuli in male ····· ***P. esakii***
   Ratio of length to basal width of urosternite V about 1/4, the terminal segments of flagellum with 7 or 8 annuli in female, 9 annuli in male ····· ***P. yasii***
9. Boundary line between oculi as long as, or longer than 2/3 length of ocular ····· 10
   Boundary line between oculi slightly shorter than 2/3 length of ocular ····· 15
10. Boundary line between oculi as long as 2/3 of ocular length ··· 11
    Boundary line between oculi longer than 2/3 length of ocular ··· 12
11. Penis slightly longer than paramere and extending backward to 2/3 length of coxite Ⅸ ····· 13
    Penis as long as paramere, parameres with 1 + 6 divisions ····· ····· ***P. wudangensis***
12. Parameres with 1 + 5 divisions ····· ***P. aureaus***
    Parameres with 1 + 5 articles ····· ***P. songi***
13. Paramere with 1 + 6 articles ····· 14
    Paramere with 1 + 5 articles, the ratio of length to basal width of urosternite V less than 1/2 ····· ***P. lineatus***
14. Body length about 11 – 14 mm, gonapophyses with 51 – 58 divisions, color of antenna uniformity ····· ***P. rhombeus***
    Body length about 7 – 8 mm, gonapophyses with 41 – 45 divisions, proximal half of flagellum whitish in color, others uniformity ··· ····· ***P. yinae***
15. Penis and paramere extending backward to 2/3 length of coxite Ⅸ ····· 16
    Penis and paramere extending backward to 3/4 length of coxite Ⅸ, paramere with 1 + 6 articles ····· ***P. tianmuensis***
16. Paramere with 1 + 5 articles ····· 17
    Paramere with 1 + 4 articles ····· ***P. majiensis***
17. Ratio of the length of basal part to terminal part 0.7 – 0.8 ····· ····· ***P. jiuzhaiensis***
    Ratio of the length of basal part to terminal part 3.0 – 3.2 ····· ····· ***P. luanchuanensis***

REFERENCES

Cheng, H-Y, Yu, D-N and Zhang, J-Y 2011. A new species of the genus *Pedetontinus* (Microcoryphia, Machilidae) from China. *Acta Zootax. Sinica*, 36: 36 – 39. [动物分类学报]

Choe, G. H. and Lee, B. S. 2001a. A new species of the genus *Pedetontinus* (Archaeognatha, Machilidae) from Korea. *Korean J. Bio. Sci.*, 5: 113 – 116.

Choe, G. H. and Lee, B. S. 2001b. Two new species of the genus *Pedetontinus* (Archaeognatha, Machilidae) from Korea. *Korean J. Bio. Sci.*, 5: 179 – 185.

Deng, K-Z, Zhang, J-Y and Yu, D-N 2011. A new species of the genus *Haslundichilis* (Microcoryphia, Machilidae) from China and redescription of *Haslundichilis hedini* (Silvestri). *Acta Zootax. Sinica*, 36: 882 – 887. [动物分类学报]

Huang, F-S, Song, Z-S and Liang, A-P 2006. A new bristletail species of the genus *Allopsontus* Silvestri (Microcoryphia: Machilidae) from Shaanxi, China. *Orient. Insects*, 40: 267 – 272.

Huelsenbeck, J. P. and Ronquist, F. 2001. MRBAYES: Bayesian inference of phylogenetic trees. *Bioinformatics*, 17: 754 – 755.

Mendes, L. F. 1990a. On a new species of *Pedetontinus* Silvestri, 1943 (Microcoryphia. Machilidae) from Northern Korea. *Garcia de Orta, Sér. Zoologia*, 17: 53 – 58.

Mendes, L. F. 1990b. An Annotated List of Generic and Species Names of Machilidae (Microcoryphia, Insecta) with Identification Keys for the Genera and Geographical Notes. Estudos. Ensaios e Documentos, 1 – 127.

Posada, D. and Crandall, K. A. 1998. MODELTEST: testing the model of DNA substitution. *Bioinformatics*, 14: 817 – 818.

Silvestri, F. 1943. Conteibuto alla conscenza dei Machilidae (Insecta, Thysanura) del Giappone. *Boll. Lab. Zool. Gen. Agr. Portici.*, 32: 283 – 306.

Simon, C., Frati, F., Beckenback, A., Crespi, B., Liu, H and Flook, P. 1994. Evolution, weighting, and phylogenetic utility of mitochondrial gene sequences and a compilation of conserved polymerase chain reaction primers. *Ann. Entomol. Soc. Am.*, 87: 651 – 701.

Song, Z-S, Huang, F-S and Liang, A-P 2011. *Machilontus* (s. str.) *medogensis* Song *et* Huang, sp. nov. from Tibet, the Northernmost record of the genus Machilonnus Silvestri, 1912 and the first record of the family Meinertellidae (Insecta: Microcoryphia: Machiloidea) in China. *Zootaxa*, 822: 61 – 68.

Sturm, H. and Machida, R. 2001. Handbook of Zoology: Band 4. Arthropoda: Insecta: Teiband/ Part 37. 37: 1 – 213.

Swofford, D. L. 2002. PAUP*: Phylogenetic Analysis Using Parsimony (and Other Methods). Ver. 4.0b10. Sinauer Associates, Sunderland, MA.

Tamura, K., Peterson, D., Peterson, N., Stecher, G., Nei, M. and Kumar, S. 2011. MEGA5: molecular evolutionary genetics analysis using maximum likelihood, evolutionary distance, and maximum parsimony methods. *Mol. Biol. Evol.*, 28: 2 731 – 2 739.

Xue, L-Z and Yin, W-Y 1991. Two new species of Machilidae from the Tianmu Mountain, China (Microcoryphia). *Contr. Shanghai Inst. Entomol.*, 10: 77 – 86.

Yu, D-N, Zhang, W-W and Zhang, J-Y 2010. Two new species of the genus *Pedetontus* (Microcoryphia, Machilidae) from China. *Acta Zootax. Sinica*, 35: 444 – 450. [动物分类学报]

Zhang, J-Y, Song, D-X and Zhou, K-Y 2005. A new species of the genus *Pedetontinus* (Microcoryphia, Machilidae) from China. *Acta Zootax. Sinica*, 30: 549 – 554. [动物分类学报]

Zhang, J-Y and Li, T 2009. A new bristletail species of the genus *Pedetontinus* (Microcoryphia, Machilidae) from China. *Acta Zootax. Sinica*, 34: 203 – 206. [动物分类学报]

Zhang, J-Y and Zhou, K-Y 2011. Descriptions of one new genus and six new species of Machilidae (Insecta: Archaeognatha) from China: morphological and molecular data. *J. Nat. His.*, 45: 1 131 – 1 164.

中国跃蛸属（石蛸目，石蛸科）一新种记述

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摘 要 记述采自江苏南京跃蛸属1新种，老山跃蛸 *Pedetontinus laoshanensis* sp. nov.，通过扩增其线粒体CO I基因，与中国已知跃蛸属其它物种进行遗传距离比较，并构建系统发生树，发现其与天目跃蛸 *P. tianmuensis* 和武当跃蛸较为接近，这也更加支持了基于形态证据的系统发生关系。并提供了跃蛸属已知19种的检索表。

老山跃蛸，新种 *Pedetontinus laoshanensis* sp. nov.（图1～17）

体长7.0～9.0 mm，复眼长/宽为0.99～1.00，中连线/长为0.50～0.55，复眼近中连线具浅色白斑，阳基侧突为1+6型，阳茎基节/端节为2.4，阳茎和阳基侧突位于第Ⅸ肢基片的1/2，产卵管初级型，其长略超第Ⅸ腹节的刺突端刺。前产卵管，分49～50节，后产卵管，分47～50节。该物种CO I基因信息见GenBank No. EU699175～EU 699177。

新种与泰山跃蛸 *P. songi*、天目跃蛸 *P. tianmuensis* 和武当跃蛸 *P. wudangensis* 相似，但复眼中连线/长、阳茎基节/端节、阳茎和阳基侧突位置、产卵管分节具明显区别。

基于CO I基因序列构建BI、MP和NJ系统发生树均有效证明老山跃蛸 *P. laoshanensis* 为单系群。基于K2p模型，新种与中国跃蛸属其它物种的遗传距离比较，与天目跃蛸 *P. tianmuensis* 遗传距离最小9.7 %，与栾川跃蛸 *P. luanchuanensis* 遗传距离最大12.1 %。结合形态和分子数据证明该物种的有效性。

正模 ♂，江苏南京老山（32°07′N，118°36′E；海拔145 m），2004-08-01，李鹏、张加勇采，编号ZJNUSB050。

词源：新种种名源自采集地地名。

关键词 石蛸目，跃蛸属，新种，中国，CO I基因.

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